

# Miniature Blackbody Calibration Source

Portable Design and High Temperature Range



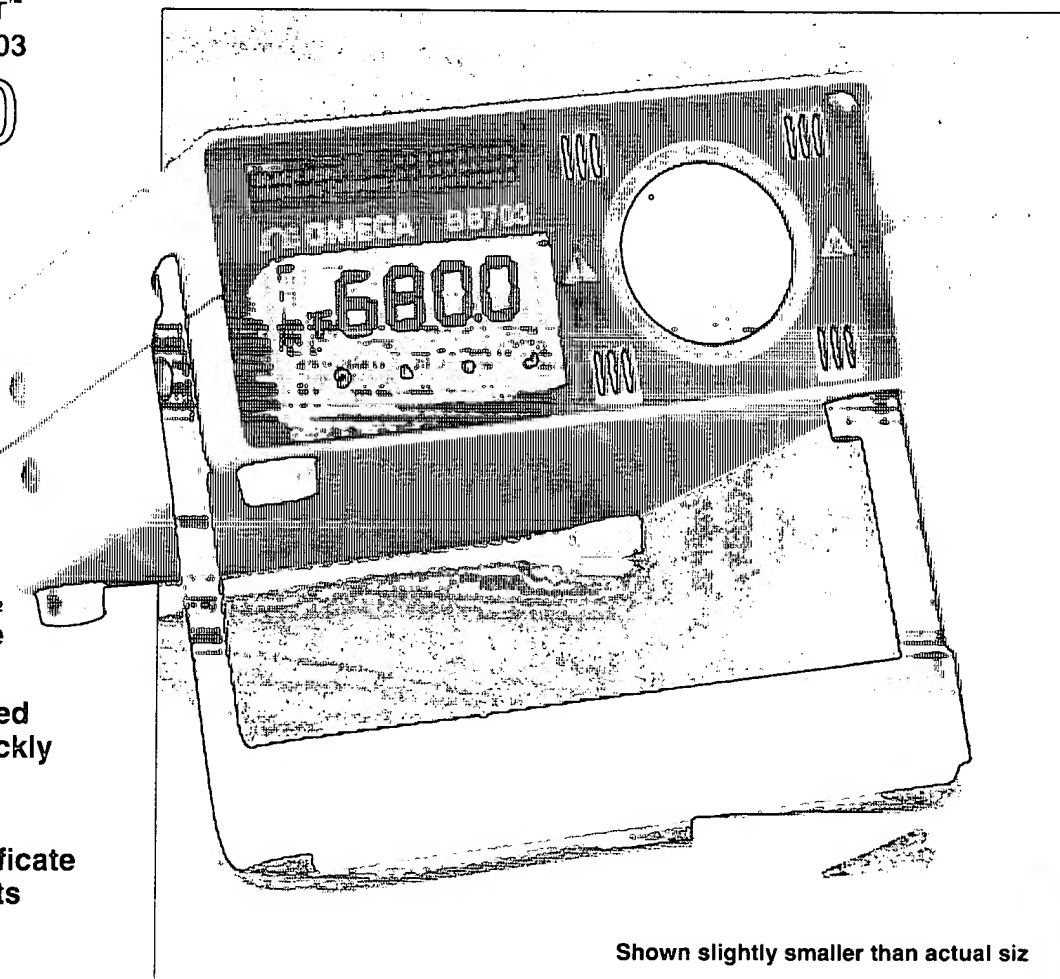
230 Vac model only

BLACKPOINT™  
Model BB703

**\$890**

Basic Unit

- ✓ Calibrates from Ambient +10 to 400°C (Ambient +20 to 752°F)
- ✓ Portable Miniature Design
- ✓ Built-in Digital  $\frac{1}{32}$  DIN Temperature Controller
- ✓ Calibrates Infrared Instruments Quickly and Accurately
- ✓ NIST-Traceable Calibration Certificate with 3 Data Points Included



Shown slightly smaller than actual size

The BB703 is a high performance, rugged, miniature blackbody calibrator. It is used for infrared pyrometer calibrations with a temperature range of ambient +10 to 400°C (ambient +20 to 752°F). With its unique miniature design and built-in 29 mm (1.125") target plate, the BB703 is an ideal and economical infrared calibrator for any laboratory or field service application.

## Specifications

### Temperature Range:

Ambient +10 to 400°C (Ambient +20 to 752°F)

**Accuracy:**  $\pm 1.4^{\circ}\text{C}$  ( $\pm 2.5^{\circ}\text{F}$ )

**Resolution:**  $0.1^{\circ}$

**Stability:**  $0.3^{\circ}\text{C}$  ( $\pm 0.5^{\circ}\text{F}$ )

**Ambient Operating Range:**

0 to 40°C (32 to 104°F)

**Target Emissivity:** 0.95

### Target Plate Diameter:

29 mm (1.125")

**Power:** 115 Vac, 50/60 Hz or 230 Vac, 50/60 Hz, 175 W

**Size:** 127 x 56 x 155 mm (5 W x 2.2 H x 6.1" D)

**Weight:** 1.09 kg (2.4 lb)

We make running changes when technical advances allow. Check at time of ordering for additional features.

OMEGACARE™ extended warranty program is available for models shown on this page. Ask your sales representative for full details when placing an order.

**Caution:** To avoid fire hazard or damage to your calibrator, always allow your calibrator to cool down to ambient temperature before returning to storage.

## To Order (Specify Model Number)

Model No.	Price	Description
BB703	\$890	Miniature blackbody calibration source, 115 Vac
BB703-230VAC*	890	Miniature blackbody calibration source, 230 Vac

\*Note: Only 230 Vac model is available as CE marked.

**Ordering Example:** BB703, 115 Vac Blackbody Calibration Source, \$890. OMEGACARE™ extends standard 3-year warranty to a total of 4 years (\$89), \$890 + 89 = \$979.

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## BB703

**Infrared Calibrator: Miniature Blackbody  
Calibration Source, Portable Design,  
Models BB703 and BB703-230VAC**3 YEAR  
WARRANTY

NEW

CE


OMEGA  
CARE1 YEAR  
2000  
COMPLIANTMADE IN  
USA**\$ 895.00****BB703**

- ✓ **Calibrates from Ambient +10 to 400°C  
(Ambient +20 to 752°F)**
- ✓ **Portable Miniature Design**
- ✓ **Built-in Digital 1/32 Temperature  
Controller**
- ✓ **Calibrates Infrared Instruments  
Quickly and Accurately**
- ✓ **NIST Traceable Calibration Certificate  
with 3 Data Points Included**

Click [here](#) for larger image.Click  
Here  
for  
Product  
Specs.

The BB703 is a high performance, rugged, miniature blackbody calibrator. It is used for infrared pyrometer calibrations with a temperature range of Ambient +10 to 400°C (Ambient +20 to 752°F). With its unique miniature design and built-in 29 mm (1.125") target aperture, the BB703 is an ideal and economical infrared calibrator for any laboratory or field service application. An NIST traceable calibration certificate is also provided.

**For complete product specifications see the Related Links section at the bottom of this page.**

**To Order** (Specify Model Number) 

Part Number	Price	Description	Qty
BB703	\$895.00	Blackbody Calibration source, 115 Vac, range: Ambient +10 to 400°C (Ambient +20 to 752°F)	<input type="text" value="0"/>
BB703-230VAC	\$895.00	Blackbody Calibration Source, 230 Vac, range: Ambient +10 to 400°C (Ambient +20 to 752°F)	<input type="text" value="0"/>

ADD TO CART VIEW CART EMPTY CART CHECK OUT 

† All dollar amounts on this site are shown in US currency.

**Note:** Only 230 Vac model is available as CE marked.

OMEGACARE<sup>SM</sup> extended warranty program is available for models shown on this page. Ask your sales representative for full details when placing an order.

**Ordering Example:** (1) **BB703** 115 Vac Blackbody Calibration Source (comes complete with operator's manual and NIST traceable calibration certificate) = **\$895**

## Related Links

### Literature

[Download](#) complete Product Specifications in [PDF format](#). 

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## BB701

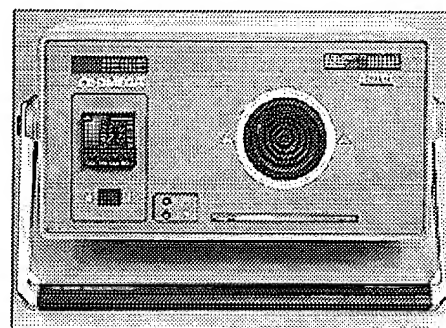
**Infrared Calibrator: Hot/Cold Blackbody  
Calibration Source, Models BB701 and  
BB701-230VAC**2 YEAR  
WARRANTY

NEW

CE


OMEGA  
CARE1 YEAR  
2000  
COMPLIANTMADE IN  
USA**\$ 2,995.00**  
**BB701**

- ✓ **Model BB701 Calibrates from -19 to 149°C (0 to 300°F)**
- ✓ **Portable Rugged Design**
- ✓ **Calibrates Infrared Pyrometers Quickly and Accurately**
- ✓ **Built in Digital PID Autotune Temperature Controller with Temperature Readout**
- ✓ **NIST Traceable Calibration Certificate Included with Three Data Points**
- ✓ **RS-232 Standard**
- ✓ **Special Nitrogen Purge Collar Limits Target Plate Frosting at Low Temperatures**
- ✓ **Built-in RTD Reference Probe Output**

Click [here](#) for larger image.

The BB701 Blackbody Calibrator is a high performance, rugged, portable calibrator for infrared pyrometers. The BB701 Hot/Cold model has a range of -19 to 149°C (0 to 300°F). The BB701's ability to provide a stable, repeatable cold calibration point allows the user to calibrate or test most infrared pyrometers quickly and accurately without having to prepare an ice bath. The target plate has a known emissivity, enabling the user to calibrate virtually any infrared pyrometer with a spot size diameter of 63.5 mm (2.5") or smaller. Both models come with an RS-232 computer interface which allows computer control of the setpoints for automatic test applications. An NIST traceable calibration certificate is also provided.

**For complete product specifications see the Related Links section at the bottom of this page.**

**To Order** (Specify Model Number) 

Part Number	Price	Description	Qty
BB701	\$2,995.00	Hot/Cold Blackbody Calibration Source, 115 Vac, range: -19 to 149°C (0 to 300°F)	<input type="text" value="0"/>
BB701-230VAC	\$2,995.00	Hot/Cold Blackbody Calibration Source, 230 Vac, range: -19 to 149°C (0 to 300°F)	<input type="text" value="0"/>

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† All dollar amounts on this site are shown in US currency.

**Note:** Only 230 Vac model is available as CE marked.

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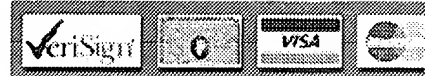
**Ordering Example:** (1) **BB701** Hot/Cold Blackbody Calibration Source (comes complete with operator's manual, reference probe connector and NIST traceable calibration certificate)  
= \$2995

## Related Links

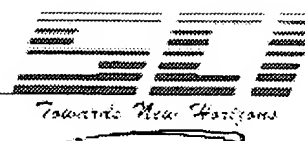
### Literature

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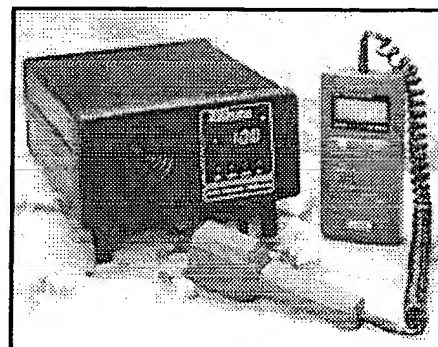


### Infrared Calibrator

#### Infrared Calibrator Model 9130

Instant verification of IR thermometer accuracy Certified traceable to NIST Lightweight yet rugged for portability Quick and uncomplicated operation.

If you've got an infrared thermometer, then you know IR sensors need frequent accuracy checks. When IRs need calibration, they can't be calibrated conventionally like thermocouples, RTDs and other sensors. You need a special IR sensor calibrator. The Hart Model 9130 handles almost any type of infrared thermometer.



Simply point your IR thermometer at the Model 9130's calibration target and adjust your IR unit to the digital readout on the calibrator. You get a NIST traceable reading of the target temperature within 0.5° C.

The specially machined concentric rings in the calibration target, or "blackbody," reduce surface reflectance and assure a true temperature reading. A high emissivity coating is baked on the target to give accurate calibration of your IR thermometer. Emissivity of 0.95 is within the range of all adjustable IR meters.

A custom etched-film heater produces the required calibration temperature and is controlled by a high grade platinum RTD sensor embedded behind the front surface of the target. The digital controller and the platinum sensor are system calibrated in Hart 's lab to assure NIST traceable accuracy in your

calibrator. A thermometer reference well is drilled into the target block for an optional standards thermometer if increased accuracy is needed. With a block stability as high as 0.1°C, precision calibrations are easy to do.

Temperature setpoint changes are easy, and temperature stabilization occurs within ten minutes. This seven pound calibrator is easy to take practically anywhere for on-site calibrations.

Any instrument service shop or calibration lab benefits from an excellent calibration tool like this one. Maintain your industrial IR thermometers and sensors using the newest and best IR calibration instrument available.

#### Model 9130 Specifications

<b>Range :</b>	°C Version: 35°C to 199.9°C °F Version: 95°F to 400°F
<b>Stability:</b>	±0.1°C

<b>Accuracy:</b>	±0.5°C
<b>Controller:</b>	Microprocessor-based PID digital controller. Displays actual and set temperatures.
<b>Temperature Setting:</b>	Digital with pushbutton data entry
<b>Cooling:</b>	Built-in cooling fan
<b>Stabilization:</b>	Appox. 10 Min
<b>Target Size</b>	: 2.25 inches (63.5 mm) dia
<b>Emissivity:</b>	0.95
<b>Reference Well:</b>	Test well drilled in the test target for verification of calibrator accuracy using a standards probe.
<b>Size :</b>	3.5"H x 7.5"W x 10"D (89mm x 191mm x 254mm)
<b>Power:</b>	120VAC (240VAC optional, add "-E" to the model number.)
<b>Weight:</b>	7 lbs (3.2 kg)
<b>Carrying Case:</b>	Optional, ABS tough foam case with O-ring
<b>Calibration Certificate:</b>	Included, with data. States compliance and traceability to NIST standards.
<b>Ordering Information:</b>	9130C Infrared Calibrator °C 9130F Infrared Calibrator °F 9301 Rugged Carrying Case

: Any enquiry ? Please email to us ([sci@pop.jaring.my](mailto:sci@pop.jaring.my))

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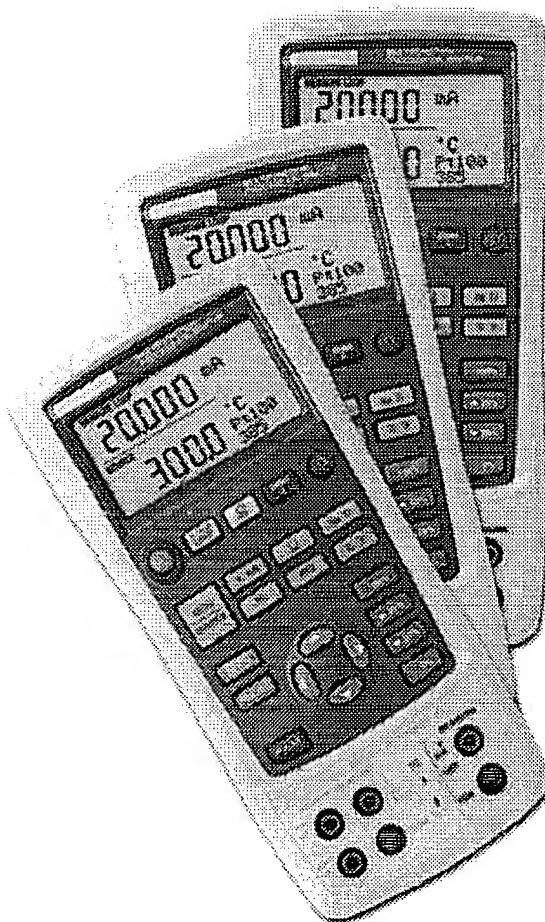
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## Understanding Specifications for Process Calibrators



**Traceable measurements ensure the uniformity and quality of manufactured goods and industrial processes.**

The initial selection of a calibrator often is based on a specification sheet - a written description of the equipment's performance in quantifiable terms that applies to all calibrators having the same model number. Because specifications are based on statistics of a large sample of calibrators, they describe the performance of a group rather than a single, specific calibrator. Any single calibrator would meet all the specifications usually would significantly exceed most of the various specification details.



Good specifications have the following characteristics:

- u They are complete.
- u They are easy to interpret and use.
- u They include the effects found in normal usage such as environment and loading.

Completeness requires that sufficient information be provided so the user can determine bounds of performance for all anticipated outputs (or inputs), all possible and permissible environmental conditions within those bounds, and all permissible loads.

Ease of use also is important. Many specifications can be confusing and difficult to interpret, thus causing mistakes in interpretations that can lead to application errors or faulty calibrations.

The requirement for completeness conflicts somewhat with that for ease of use; one must be traded for the other. The challenge of specification design is to mutually satisfy both. This is sometimes accomplished by bundling the effects of many error contributions within a useful, common window of operation. For example, the listed performance may be for a period of six months when used in a temperature range of 23°C to 15°C, in humidity up to 80%, and for all loads up to a specified maximum rating. This is a great simplification for the user because the error contributions of time, temperature, humidity and load are included in the basic specification and can be ignored as long as operation is maintained within the listed bounds.

### The Importance of Specifications

Comprehensive specifications are essential in maintaining a chain of traceability and ensuring global uniformity of products, quality and safety.

**Traceability.** Traceability is a term that refers to the fact that instruments have been tested to conform with the official standards for the parameters they measure. This means that measurements made by this equipment are traceable to national standards. A certified instrument is one that has been tested regularly by even better-performing certified instruments. Specific test procedures are used, and the results are documented and must be repeated at specific time intervals. This chain sequence of comparing to superior performing devices is repeated until, finally, specific comparisons are made with standards maintained by national authorities such as the National Institute of Standards and Technology in the United States. This unbroken chain of comparisons often is called a "traceability chain."

For a process calibrator, traceability refers to the fact that the process calibrator's measurement functions have been verified to perform within its required specifications and that this usage of the calibrator falls within the appropriate limits of performance, input signal levels, environmental conditions, conditions of use and time between performance verifications. The performance usually is checked using the procedures recommended by the manufacturer and the recommended types of superior performing equipment.

Traceable measurements ensure the uniformity and quality of manufactured goods and industrial processes. They are essential to the development of technology. Without traceable measurements, variances can occur in product/process quality that often are costly. Bad quality is expensive, both in terms of cost to rectify and in damage to a company's reputation. Traceable measurements also support equity in trade as well as compliance to regulatory laws and standards.

The global acceptance of the ISO 9000 quality standards also has led to an increase in commercial requirements for the traceable calibration of test and measurement equipment.

The purpose is to ensure that the products manufactured in one country will be accurate in another on the basis of agreed-to measurement standards, methods and practices.

### How Good Should a Calibrator's Specifications Be?

Whether doing instrument calibration, industrial process control or even product performance testing, the equipment performing the test must always have superior performance when compared to the tolerances of the test. Test Uncertainty Ratio (TUR) describes the ratio of test tolerance to the superior performance of the testing equipment. To eliminate undesired effects due to errors in the calibration equipment, it is desired that the test equipment's performance be 10 or more times better than the test tolerance limit. However, often this is not practical to achieve. Consequently, it has been shown that if the test equipment is three to five times better than the test tolerance, then the calibration error has no practical consequence. As a result, it is commonly accepted in industry that a four-to-one ratio is an adequate TUR. For example, if a transmitter with an accuracy specification of 1% is to be checked by a calibrator, the performance of the calibrator must be better than or equal to 0.25% (thereby having a minimum of four times better performance than the transmitter).

### Calibrator Performance vs. Its Specifications

It must be understood that the published specifications of a calibrator apply to an entire population of equipment provided by a manufacturer, not just one individual piece of equipment. Consequently, an individual piece of equipment should not just marginally meet its published specifications but usually should perform much better than its published specification. Just how much better is determined by the philosophy and policies of the manufacturer.

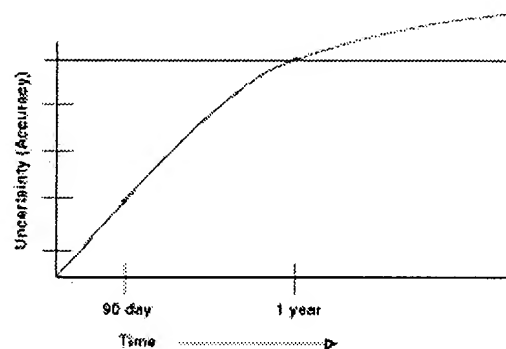


Figure 1. A calibrator can be specified to superior performance levels at the time of calibration; but such levels are only good for a few minutes following calibration.

*Interpreting Specifications.* Many companies have complex procedures and tests that a calibrator must pass prior to purchase and acceptance. But, before that evaluation begins, one must decide which calibrators should be evaluated. The calibrator specifications are usually the first step in the process.

Ideally, specifications are a written description of a calibrator's performance that quantifies its capabilities. It should be remembered that specifications do not equate to performance - they are performance parameters. They can be conservative or aggressive. Manufacturers are not bound by any convention as to how they present specifications.

The buyer also should be aware that a calibrator specification applies to an entire run of a particular instrument model. Because variation in the performance of individual calibrators from nominal tends to be distributed normally, a large majority of the units of a specific model should perform well within their specification limits. In fact, most individual calibrators can be expected to perform better than specified, although the performance of any individual calibrator should never be taken as representative of the model class as a whole.

The calibrator will most likely provide reliable performance, but there is always a small chance that its performance will be marginal, or even out of specification, at some parameter or function.

**Accuracy vs. Uncertainty.** Typically, the number on the cover of a data sheet or bl read "accuracy to 0.02%." This is commonly accepted usage equivalent to saying "measurement uncertainty of 0.02%." It means that measurements made with the can be expected to be within 0.02% of the true value. In examining a specification to be aware that a specification such as this:

- Is often over the shortest time interval.
- Is often over the smallest temperature span.
- Is sometimes a relative specification.
- May be derived using a nonconservative confidence level.

Consider the impact of each of these factors.

**Time.** Specifications usually include a specific time period during which the calibrator can be expected to perform as specified. Setting this time period or calibration interval is necessary to account for the drift rate inherent in a calibrator's analog circuitry.

This is the calibration interval, or the measure of a calibrator's ability to remain within its stated specification

for a certain length of time. Time periods of 30, 90, 180 and 360 days are common practical. Figure 1 shows how a calibrator's uncertainty increases over time. When evaluating specifications, make sure you're comparing the same time intervals.

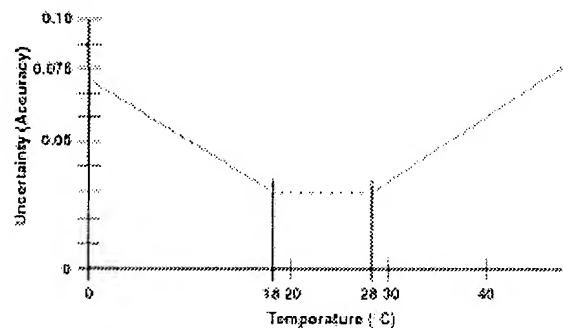


Figure 2. Out the specified range, a temperature coefficient is used to describe the degradation of the accuracy specification.

Any calibrator can be specified to super-high performance levels at the time of calibration. Unfortunately, such levels are good for only the first few minutes following calibration. Specifications for a calibrator do not state the time interval over which they are valid. The manufacturer should be contacted for a clarification.

**Temperature.** Performance over the specified temperature range also is critical. Make sure the temperature intervals specified will meet your workload requirements.

The specified temperature range is necessary to account for the thermal coefficient of the calibrator's analog circuitry. The most common ranges are centered about room temperature, 23°C ± 15°C. This range reflects realistic operating conditions. Remember, the temperature bounds must apply for the entire calibration interval. Thus, a temperature specification of 23°C ± 1°C presumes very strict long-term control of the operating environment. Such a temperature range would not be representative of normal operation of a process calibrator.

Outside the specified range, a temperature coefficient (TC) is used to describe the degradation of the accuracy specification. The TC represents an error component that must be added to a calibrator's specification if it is being used outside of its nominal temperature range.

range. A temperature coefficient graph is shown in figure 2.

In figure 2, as an example, the uncertainty as a function of temperature at full scale 11 V DC range of a calibrator is shown. The dashed line shows the specified accuracy 23°C 15°C temperature range. Within the span of the dashed line, the accuracy is specifications of 0.030% of full scale. This is in line with a specification of "0.025% reading +0.005% of full scale when used at 23°C 15°C." This applies for a range of C. Beyond this range, the instrument's performance degrades as shown by the slope TC usually will take the form:

$$TC = X \%$$

$$^{\circ}\text{C}$$

where X is the amount the performance degrades per change in degree beyond the range specification. To calculate the accuracy due to temperatures outside of the specification, the temperature modifier, Tmod, is needed. The formula is:

$$T_{\text{mod}} = |TC \times gt|$$

where gt is operating temperature minus the temperature range limit, t is the proposed operating temperature, and range limit is the range limit that t is beyond.

If one wishes to use a calibrator in an ambient temperature outside of its specified range, the effects of TC must be added to the baseline accuracy specification when calculating total accuracy. Tmod is used to calculate the total specification using the general formula:

$$\text{Total Spec} = (\text{Basic Accuracy at a Specific Temperature Range}) + T_{\text{mod}}$$

For example, suppose you have a calibrator that has rated accuracy of 0.030% at 23°C. Its TC is 0.0025%/°C. To calculate the accuracy of the calibrator for operation at 32°C:

$$t = 32$$

$$\text{Range Limit} = 23 + 5 = 28$$

$$T_{\text{mod}} = 0.0025\% |32-28|$$

$$T_{\text{mod}} = 0.0025\% |4| = 0.01\%$$

$$\text{total spec} = 0.030\% + 0.010\%$$

$$= 0.040\%$$

As can be seen, the specification may change dramatically when the effects of performance due to temperature are considered.

Knowing how to calculate Tmod will be necessary when comparing two instruments that are specified for

Vendor	Stated Specification at 10 V	Cost
X	0.015%	
Y	0.025%	

Table 1. Specifications for

different temperature ranges. To truly compare the two calibrators, one needs to put them in the same terms (23°C/15°C) using the preceding calculation.

conservative to ensure the calibrator is in tolerance at the end of its calibration interval.

Most modern calibrators are specified to operate in wider temperature ranges because calibration instruments are no longer used only in the closely controlled laboratory. Calibration at the process plant demands greater temperature flexibility.

**Allowance for Traceability to Standards.** Uncertainty specifications also must be expressed as relative or total. Relative uncertainty does not include the additional uncertainty of the reference standards used to calibrate the instrument. For example, when a calibrator's uncertainty is specified as relative to calibration standards, this covers only the uncertainty in the calibrator. This is an incomplete statement regarding the instrument's total uncertainty. Total uncertainty includes all uncertainties in the traceability chain: the uncertainty of the unit plus the uncertainty of the equipment used to calibrate it.

**Confidence Level.** The most critical factor in a calibrator's performance is what percentage of the calibrators will be out of calibration at the end of its calibration interval. Specifications must be conservative to ensure the calibrator is in tolerance - with a high degree of confidence - at the end of its calibration interval.

For example, say that vendors X and Y offer calibrators. Vendor X's specifications state that its calibrator can supply 10 V with an accuracy of 0.019%, and vendor Y's specification is 0.025% accuracy for the 10 V output. Neither of the data sheets for the calibrators supply a confidence level for the specifications, nor do they state how the accuracy is distributed.

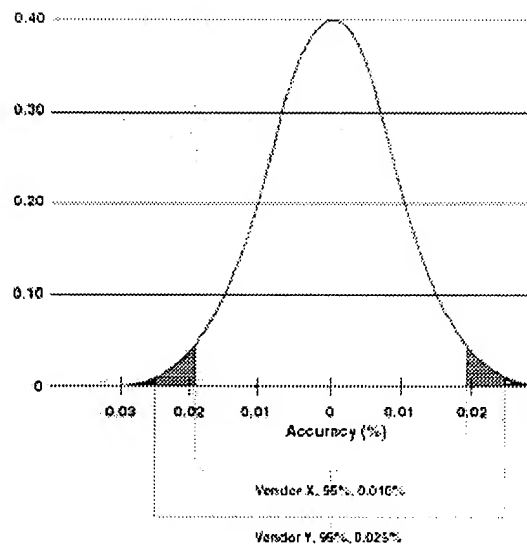


Figure 3. Identical calibrator performance can have different specifications, depending on how aggressive the manufacturer chooses to be.

When questioned, the vendors will state that their specifications are based on a normal distribution of accuracy and have the following confidence levels. Their responses are tabulated in table 1.

In this example, the actual performance of the calibrators is identical (figure 3). Vendor X, choosing a confidence level of 95%, is willing to risk 5% of their calibrators being out of spec at the end of the stated time interval, and states a spec of 0.019%. The shaded solid areas under the normal distribution curve represent the fraction of the calibrator population at risk. Vendor Y, choosing a confidence level of 99%, is willing to risk 1% of their calibrators being found out of spec, and states a spec of 0.025%. The solid area

under the curve represent the fraction of the calibrator population at risk. So you see identical calibrator performance can yield different specifications, depending on how aggressive the calibrator manufacturer chooses to be with the specifications of your calibrator.

Before making a purchase, it is critical to gain an understanding of a vendor's philosophy with respect to confidence level and ask the vendor to clarify the confidence level where there is doubt as to what it is.

Accuracy specifications are an important part of determining whether or not a particular calibrator will satisfy a need. There are, however, many other factors that determine which calibrator is best suited for an application, including the work load, support standards of manufacturer support and reliability.

This article has been adapted from "Chapter 31: Instrument Specifications" in *Calibration Philosophy in Practice*, Second Edition, Fluke Corp., 1994.

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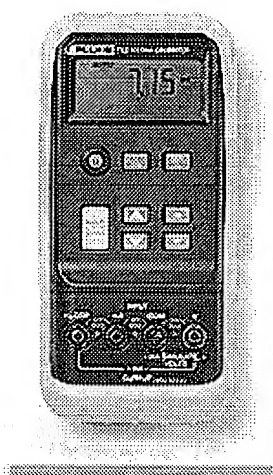
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## FLUKE INSTRUMENTS

### The Fluke 710 Series Process Calibrators

#### Fluke 715 Volt/mA Calibrator

The Fluke 710 Series Process Calibrators offer a clear new choice in single-function calibrators. These hand-held calibrators deliver outstanding performance, durability and reliability. Offered in the rugged Fluke 80 Series DMM package, the calibrators are compact, lightweight, and easy to carry. With a push button interface similar to the multifunction Fluke 740 Series Documenting Process Calibrators, the 710s are easy to use. Each calibrator is EMI tolerant, dust and splash resistant, and features a removable battery door for quick battery changes.



#### Features

- Measure loop current (0-20 mA, 4-20 mA) signals with 0.025% accuracy and 1 mA resolution
- Measure voltage output process signals from PLCs, transmitters
- Source or simulate 24 mA loop current
- Source voltage to 100 mV or 10V
- 24V loop supply with simultaneous current measurement

Function Specifications	
<b>Loop Supply</b>	<b>Range:</b> 24 V dc  <b>Resolution:</b> N/A  <b>Accuracy:</b> +/- 10% Note: Drive; 20 mA into 1000 W for battery >6.8V; 700 W for battery 5.8 to 6.8 V
<b>Measure/simulate mA/% of span</b>	<b>Range:</b> 0 to 24 mA (-25% to 125%)  <b>Resolution:</b> 0.001 mA  <b>Accuracy:</b> 0.015% + 2 counts Note: Sink (simulate transmitter) Display mA or % of span
<b>Measure/simulate mV</b>	<b>Range:</b> 0 to 100 mV  <b>Resolution:</b> 0.01 mV  <b>Accuracy:</b> 0.02% + 2 counts
<b>Measure/simulate V</b>	<b>Range:</b> 0 to 10 V

	<b>Resolution:</b> 0.001 V
	<b>Accuracy:</b> 0.02% + 2 counts

General Specifications	
<b>Operating temperature:</b>	-10°C to 55°C
<b>Non-operating temperature:</b>	-40°C to 60°C
<b>Relative humidity (% RH operating without condensation):</b>	95% (10°C to 30°C); 75% (30°C to 40°C); 45% (40°C to 50°C); 35% (50°C to 55°C)
<b>Operating altitude:</b>	3,000m max
<b>Vibration:</b>	Random, 2g, 5-500 Hz
<b>Shock:</b>	1m drop test
<b>Safety:</b>	CSA C22.2 No. 1010.1:1992
<b>Power:</b>	Single 9V battery ANSI/NEDA 1604A or IEC 6LR619V alkaline
<b>Size (with holster):</b>	201 mm L x 98mm W x 52 mm D (7.93 in X 3.86 in x 2.06 in)
<b>Weight (with holster):</b>	Approx. 600g (21 oz)
<b>Size (without holster):</b>	187 mm L x 87mm W x 32 mm D (7.35 in X 3.41 in x 1.25 in)
<b>Weight (without holster):</b>	Approx. 330g (12 oz)
<b>Display:</b>	Clear, 5 digit liquid crystal
<b>Warranty:</b>	3 years

Model Name	Product Description
<b>Fluke-715</b>	Volt/mA Calibrator. Calibrator includes: C81Y Protective Yellow Holster with Flex-Stand™, Test Leads and Alligator Clips, single 9V alkaline battery, Instructions Sheet (14 languages).

**Model 715 • Multimeter**  
**Basic Price \$795.00 + S&H**

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\* A MINIMUM ORDER OF \$100 REQUIRED

Model Name	Accessory or Option Description
<b>80T-150U</b>	Universal Temperature Probe
<b>80T-IR</b>	Non-Contact Infrared Temperature Probe
<b>80TK</b>	Thermocouple Module (Not 179)
<b>AC20</b>	Industrial Test Clips
<b>AC80</b>	Hook-Style Test Clips
<b>C100</b>	Universal Carrying Case
<b>C25</b>	Soft Case DMM with Holster
<b>C510</b>	Leather Meter Case
<b>C530</b>	Leather Accessory Case
<b>C550</b>	Tool bag
<b>C800</b>	Hard Storage Case
<b>C81G</b>	Holster (Grey)
<b>C90</b>	Soft Case DMM
<b>Fluke 700-IV</b>	Current Shunt
<b>FOA ST/ST</b>	ST to ST Coupling
<b>FOC-ST/FC</b>	ST to FC Fiber Optic Converter Cable (Multimode)
<b>FOC-ST/SC</b>	SC/ST 62.5 $\mu$ m Multimode patch cable
<b>FOC-ST/SMA</b>	ST to SMA Fiber Optic Converter Cable (Multimode)
<b>FOC-ST/ST</b>	ST to ST Fiber Optic Patch Cable (Multimode)
<b>FOM</b>	Fiber Optic Meter includes an optical power meter, two multimode ST-ST patch cables, one multimode ST-ST adapter, instruction sheet and instrument case.
<b>FOS-1300</b>	1300 nm Fiber Optic Source (LED, Multimode)
<b>FOS-850</b>	850 nm Fiber Optic Source (LED, Multimode)
<b>FOS-850/1300</b>	Fiber Optic LED Power Source that transmits 850 nm and 1300 nm wavelengths
<b>i1010</b>	Clamp-on AC/DC Current Probe
<b>i410</b>	Clamp-on AC/DC Current Probe
<b>PV350</b>	Pressure/Vacuum Module (0 to 350 PSI)
<b>TL20</b>	63" Test Lead Set
<b>TL22</b>	63" Right Angle Silicone Test Lead Set

<b>TL24</b>	63" Right Angle/Straight Silicone Test Leads
<b>TL71</b>	Premium DMM Test Lead Assembly
<b>TL74</b>	4 mm Diameter Test Leads
<b>TL75</b>	48" Hardpoint Test Lead Set
<b>TP20</b>	Industrial Test Probe
<b>Y8140A</b>	48" Slim Flex Test Lead Set

For Accessories – Please Request Information



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**\* All prices subject to change without notice**

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